AN13802

FlexTimer Module Synchronization with ADC and DMA

Rev. 1 — 29 August 2023 Application note

Document Information

Information	Content
Keywords	AN13802, FlexTimer Module, FTM
Abstract	The FlexTimer module (FTM) is an enhanced version of the Timer/PWM module (TPM) used in motor control and Switched Mode Power Supply (SMPS) applications.

1 Introduction

The FlexTimer module (FTM) is an enhanced version of the Timer/PWM module (TPM) used in motor control and Switched Mode Power Supply (SMPS) applications.

There are embedded applications that require several modules to work together in a specific order and with precise timing. This document describes the FTM hardware synchronization with Analog-to-Digital Converter (ADC) and Direct Memory Access (DMA).

2 ADC conversion triggers

This section describes how the FTM triggers ADC conversion. Figure 1 describes the workflow of the ADC module. There are eight trigger sources to trigger the ADC conversion, listed in Table 1.

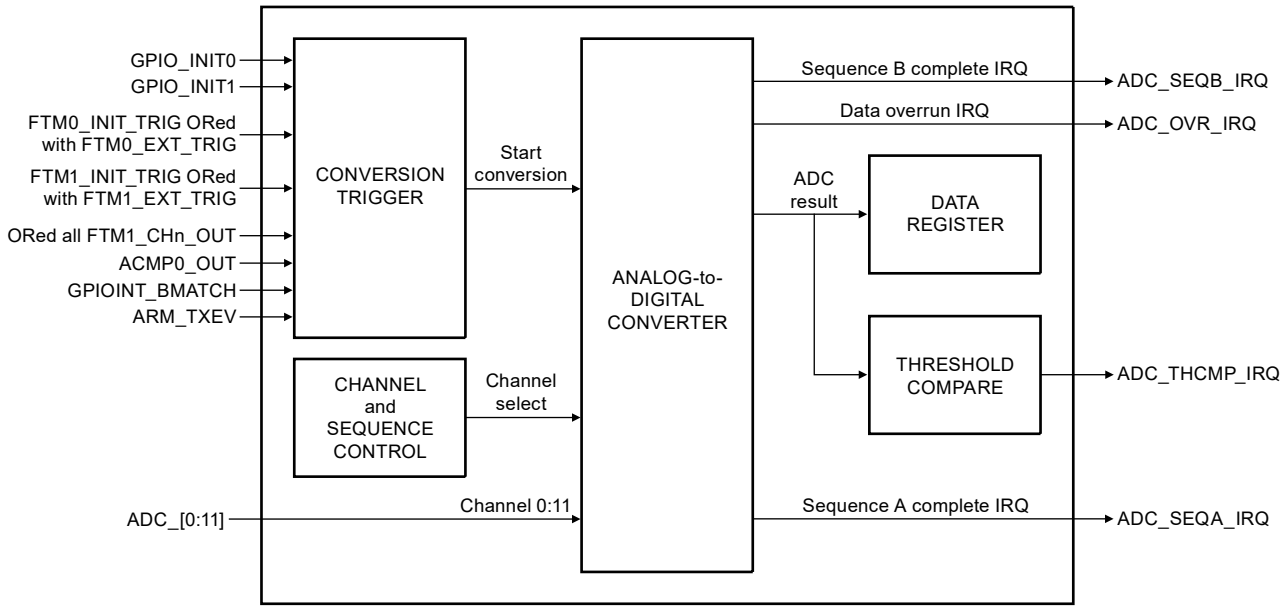

Figure 1. ADC block diagram

Users can set the corresponding register to choose which trigger sources are used to trigger ADC conversion, see Table 1.

Table 1. ADC trigger inputs

Selection	Input source
0	No hardware trigger
1	GPIO_INT0
2	GPIO_INT1
3	FTM0_INIT_TRIG ORed with FTM0_EXT_TRIG
4	FTM1_INIT_TRIG ORed with FTM1_EXT_TRIG
5	ORed all FTM1_CHn_OUT
6	ACMP0_OUT
7	GPIOINT_BMATCH
8	ARM_TXEV

2.1 FTM synchronization with ADC

Figure 2 describes the interconnections between FTM and ADC.

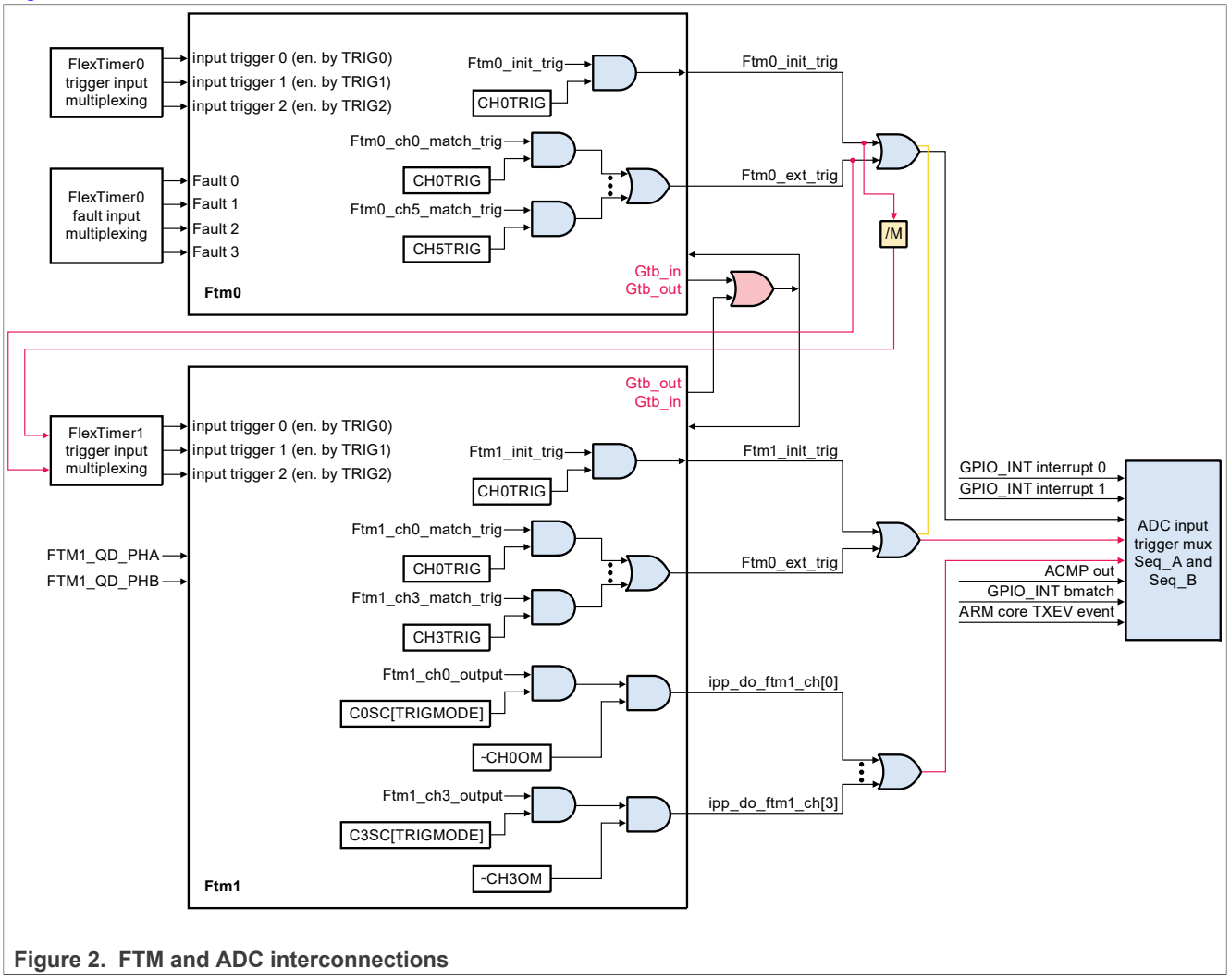

Figure 2. FTM and ADC interconnections

2.2 FTM triggers ADC examples

Set the `FTM0_INIT` trigger ADC as follows:

```
ADC0->SEQA_CRTL.TRIGGER=0x3; //set ADC internal trigger source to FTM0_INIT
FTM0->EXTTRIG = FTM_EXTTRIG_CH0TRIG_MASK | FTM_EXTTRIG_CH1TRIG_MASK; //enable
 FTM0 channel 0 and channel 1 to be external trigge
```

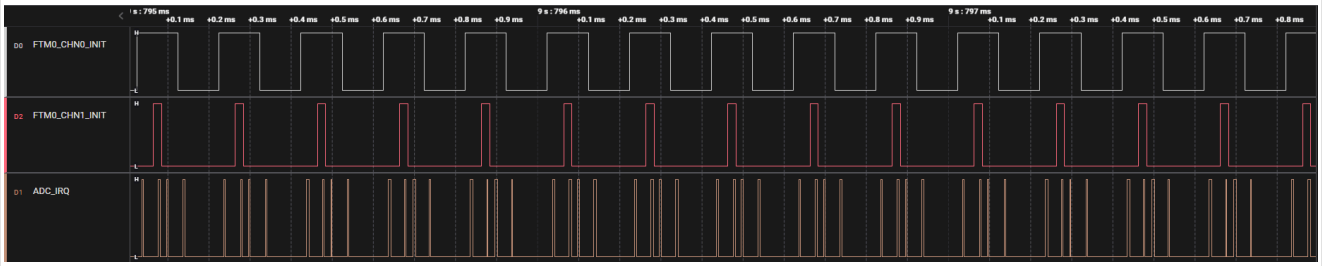

Figure 3. FTM0 triggers ADC example

The ADC is triggered by `FTM0` channel initialization trigger, see Figure 3. The `FTM1_INIT` trigger of the ADC is the same as `FTM0` and can be set as follows:

```
ADC0->SEQA_CRTL.TRIGGER=0x4, //set ADC internal trigger source to FTM1_INIT
FTM1->EXTTRIG = FTM_EXTTRIG_CH0TRIG_MASK | FTM_EXTTRIG_CH1TRIG_MASK; //enable
 FTM1 channel 0 and channel 1 to be external trigger
```

Besides, the ADC is triggered by `FTM1` output triggers. The `FTM1` channel output trigger of the ADC can be set as follows:

```
ADC0->SEQA_CTRL.TRIGGER = 0x5; //set ADC internal trigger source to FTM1_OUTPUT
 trigger
FTM1->CONTROLS[n].CnSC = FTM_CnSC_ELSB_MASK | FTM_CnSC_TRIGMODE_MASK; //enable
 FTM1 output Trigger mode
```

For more details, see Figure 4.

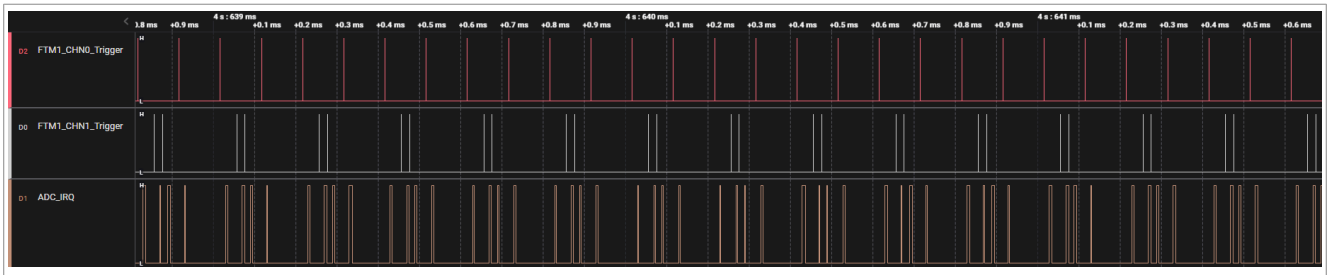

Figure 4. FTM1 triggers ADC example

3 DMA triggers

Figure 5 describes the DMA workflow, there are 13 trigger inputs that can be triggered by various peripherals, including FTM. These input triggers are all listed in Table 2.

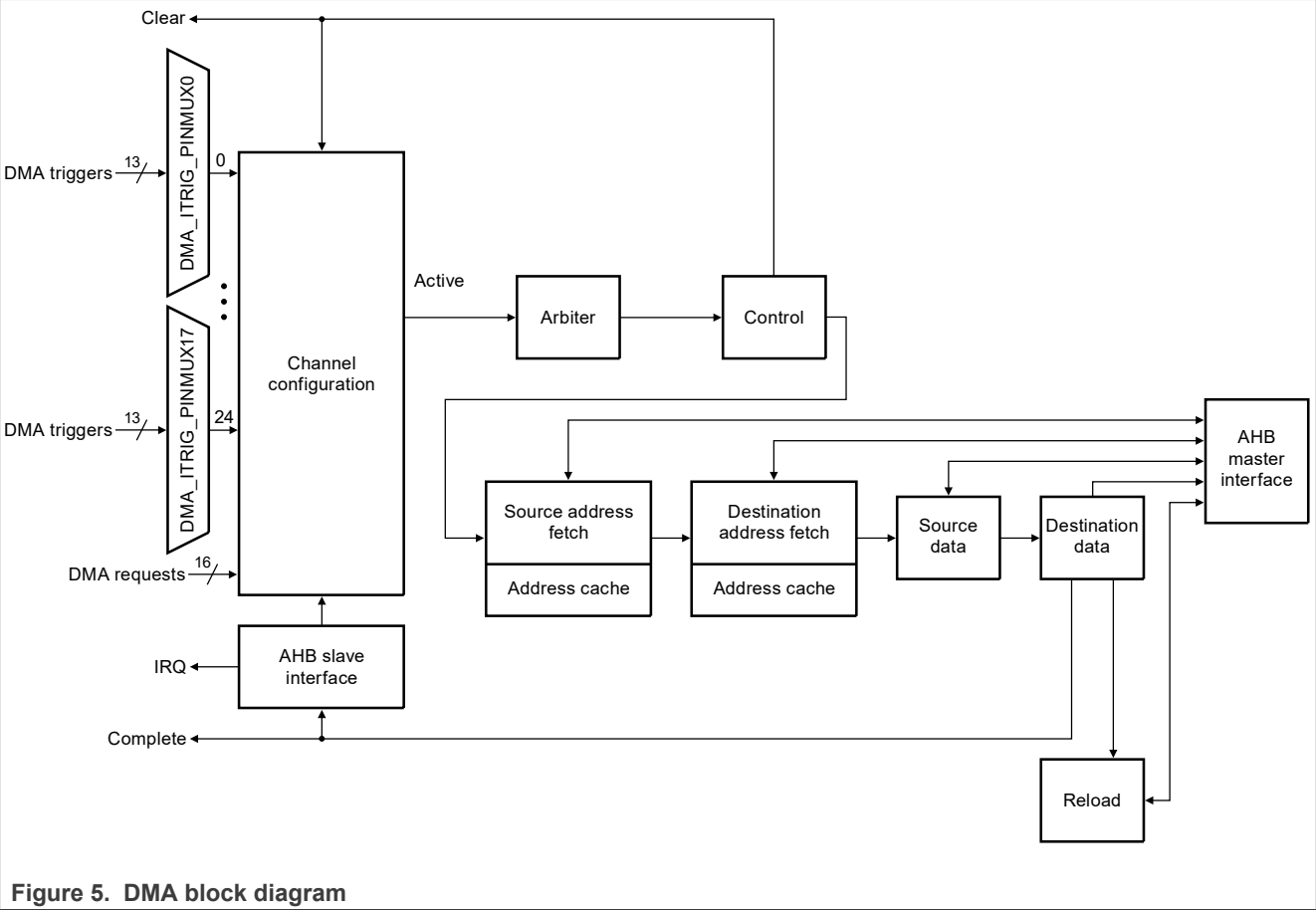

Figure 5. DMA block diagram

Table 2. SDMA triggers

Selection	Input source
0	GPIO_INT4
1	GPIO_INT5
2	GPIO_INT6
3	GPIO_INT7
4	ADC0_SEQA_IRQ
5	ADC0_SEQB_IRQ
6	COMP0_OUT
7	FTM0_INIT_TRIG ORed with FTM0_EXT_TRIG
8	FTM1_INIT_TRIG ORed with FTM1_EXT_TRIG
9	Ored(FTM0_CH0, FTM0_CH1,.., FTM0_CH5)
10	Ored(FTM1_CH0, FTM1_CH1,.., FTM1_CH3)
11	SDMA_TRIGOUT_A
12	SDMA_TRIGOUT_B

3.1 FTM synchronization with DMA

Figure 6 describes how the FTM trigger DMA. The FTM trigger settings are same as ADC.

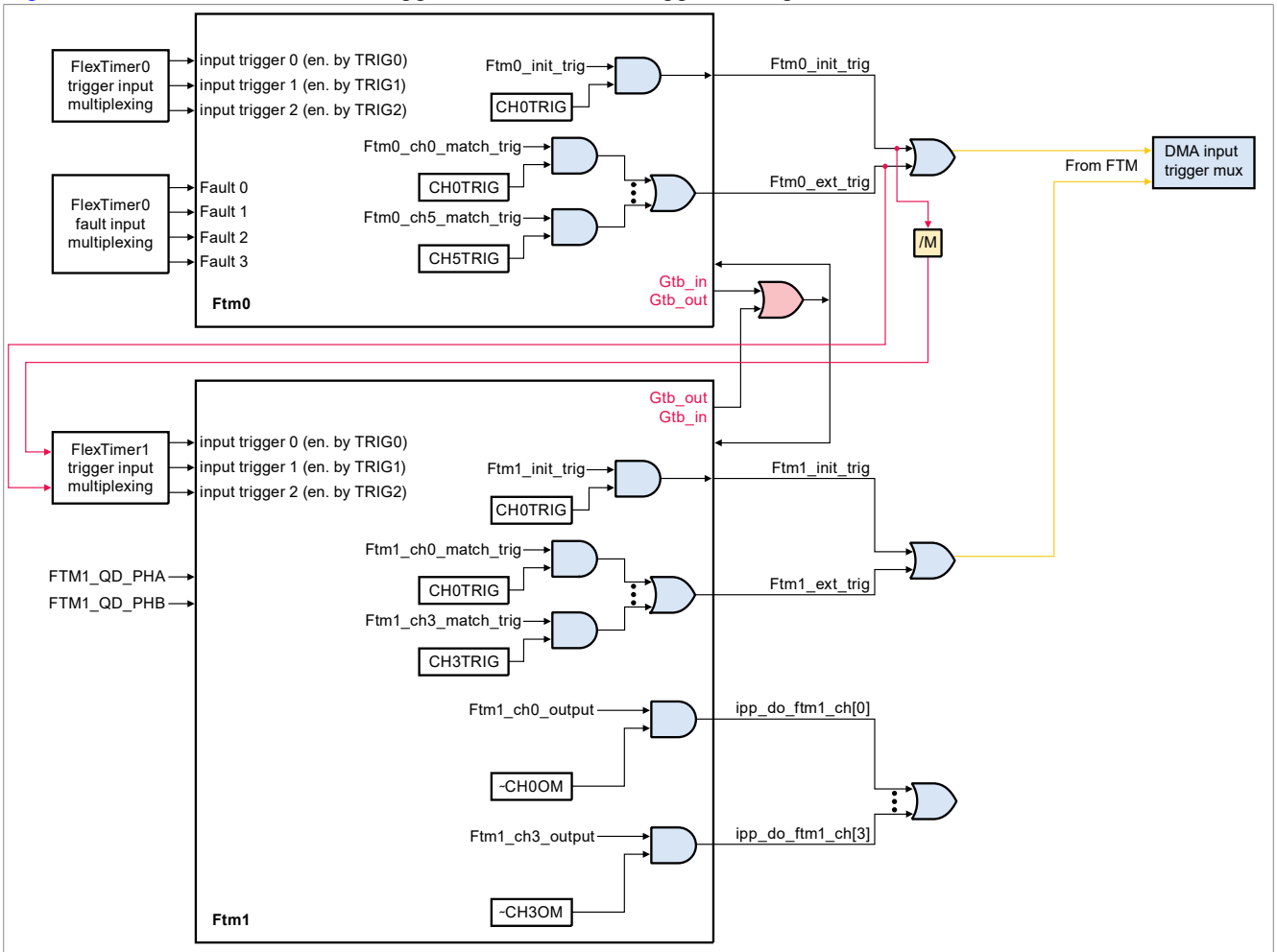

Figure 6. FTM and DMA interconnections

4 Revision history

Table 3 summarizes revisions to this document.

Table 3. Revision history

Revision number	Release date	Description
1	29 August 2023	Initial public release

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Date of release: 29 August 2023
Document identifier: AN13802